

## **Description**

### **COLLOIDAL SILVER MAKER AND WASHING MACHINE HAVING THE SAME**

#### **Technical Field**

- [1] The present invention relates, in general, to a colloidal silver maker and, more particularly, to a washing machine with a colloidal silver maker which has an outlet hole improved in shape and arrangement thereof, thus preventing water from remaining in the colloidal silver maker.

#### **Background Art**

- [2] Generally, washing machines are appliances to wash laundry placed in a washing tub, by agitating the laundry inside the washing tub in the presence of wash water and a detergent.
- [3] The washing machine includes a motor, a water tub, the washing tub, a pulsator, and a detergent feeder. The water tub contains wash water therein. The washing tub is rotatably set in the water tub, with the laundry to be washed being placed in the washing tub. The pulsator is rotatably projected from a bottom of the washing tub, and agitates the laundry in the wash water. The detergent feeder is provided at a predetermined position above the water tub, and feeds detergent into the wash water fed from an external water source.
- [4] The washing machine is operated as follows. First, the laundry is loaded into the washing tub. The wash water, mixed with the detergent fed from the detergent feeder, is supplied to the water tub. When the motor operates in such a state, the pulsator rotates in alternating directions to agitate the laundry in the wash water, thus washing the laundry.
- [5] Recently, there has been developed a washing machine having a colloidal silver maker to add silver ions into wash water while the wash water is fed into the water tub, thus producing colloidal silver which kills germs on the laundry while washing the laundry. Therefore, the washing machine with the colloidal silver maker has both antibacterial and bactericidal effects.
- [6] The colloidal silver maker includes a pair of silver plates to which a predetermined voltage is applied. When the wash water passes through the silver plates, the silver plates dissociate the silver ions into the wash water by electrolysis of the silver plates, so that colloidal silver is produced and fed into the water tub.
- [7] The washing machine with the colloidal silver maker allows the laundry to be

washed by the wash water in which the silver ions of a predetermined concentration are dissolved, thus killing germs on the laundry.

[8] In this case, the colloidal silver maker includes an inlet hole through which the wash water is introduced into the colloidal silver maker, and an outlet hole through which the wash water is discharged from the colloidal silver maker. The outlet hole of the colloidal silver maker is connected to an inlet of the detergent feeder via a connection pipe, so that the colloidal silver maker communicates with the detergent feeder.

[9] Thus, the wash water fed through the inlet hole to an inside of the colloidal silver maker is mixed with the silver ions dissociated from the silver plates by the electrolysis of the silver plates. Thereafter, the wash water containing the silver ions is fed to the detergent feeder through the outlet hole of the colloidal silver maker.

[10] However, the conventional colloidal silver maker has a problem in that the outlet hole has a circular shape to discharge the wash water containing the silver ions to the detergent feeder, so that a large amount of water may remain in the colloidal silver maker when a water supply operation is stopped.

[11] In a detailed description, when the water supply operation is being performed, the wash water smoothly passes through the circular outlet hole due to a pressure of the wash water, and then is fed to the detergent feeder. However, when the water supply operation ceases and the wash water is not fed to the colloidal silver maker, the pressure of the wash water fed into the colloidal silver maker uniformly acts on an entire cross-sectional area of the circular outlet hole, so that a water film is formed on the outlet hole due to a capillary action. Thus, the wash water may not be completely discharged from the colloidal silver maker, but some of the wash water may remain in the colloidal silver maker.

[12] As such, in case where some of the wash water remains in the colloidal silver maker after the water supply operation is stopped, the silver plates are immersed in the wash water. In this case, the silver plates may corrode due to a reaction between the silver plates and the wash water. Further, impurities may be adhered to the silver plates, thus hindering the silver ions from being dissociated from the silver plates. In this case, a desired sterilizing effect is not achieved, and life spans of the silver plates are undesirably reduced.

## **Disclosure of Invention**

### **Technical Problem**

[13] It is an aspect of the present invention to provide a colloidal silver maker, which is

constructed so that there is no water in a silver ion casing when a water supply operation is stopped, thus preventing silver plates from corroding and preventing impurities from being adhered to the silver plates.

[14] It is another aspect of the present invention to provide a washing machine having the colloidal silver maker.

[15] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

### **Technical Solution**

[16] The above and/or other aspects are achieved by a colloidal silver maker including a plurality of silver plates and a silver ion casing having an outlet hole to discharge colloidal silver, containing silver ions dissociated from the silver plates, to an outside of the silver ion casing. The outlet hole is provided so that a first distance between an upper edge to a lower edge of the outlet hole is different from a second distance between both side edges of the outlet hole.

[17] According to an aspect of the invention, the outlet hole may have a shape of an ellipse, with a major axis of the ellipse being aligned in a vertical direction.

[18] In another aspect of this embodiment, the colloidal silver maker may further include a lid to cover an upper portion of the silver ion casing, with an inlet hole being provided on a predetermined portion of the lid to feed water into the silver ion casing. The plurality of silver plates may be placed in the silver ion casing while being supported by the lid.

[19] In yet another aspect of this embodiment, the outlet hole may be provided on a surface of the silver ion casing to extend from a lower end toward an upper end of the silver ion casing.

[20] The above and/or other aspects are achieved by a colloidal silver maker including a plurality of silver plates, and a silver ion casing having an outlet hole to discharge colloidal silver, containing silver ions dissociated from the silver plates, to an outside of the silver ion casing. The outlet hole is provided on a surface of the silver ion casing to extend from a lower end toward an upper end of the silver ion casing and has a predetermined height so that the outlet hole is not blocked by a water film.

[21] A height of the water contained in the silver ion casing and the height of the outlet hole may be in a ratio of about 3:2.

[22] The above and/or other aspects are achieved by a washing machine with a colloidal silver maker, the colloidal silver maker including a plurality of silver plates, and a

silver ion casing having an outlet hole to discharge colloidal silver, containing silver ions dissociated from the silver plates, to the water tub. The outlet hole is provided so that a first distance between an upper edge to a lower edge of the outlet hole is longer than a second distance between both side edges of the outlet hole.

### **Advantageous Effects**

[23] As is apparent from the above description, the present invention provides a washing machine with a colloidal silver maker, which is constructed so that an outlet hole of a silver ion casing has a shape of an ellipse and is arranged in a vertical direction, thus preventing wash water from remaining in the silver ion casing when a water supply operation is stopped and thereby preventing silver plates from corroding. Further, according to the present invention, the washing machine with the colloidal silver maker prevents impurities from being adhered to the silver plates, thus allowing silver ions from being smoothly dissociated from the silver plates, and prolonging life spans of the silver plates.

[24] In the washing machine having the colloidal silver maker, the outlet hole extends from a lower end toward an upper end of the silver ion casing, and the outlet hole and the silver ion casing are in a proper ratio to each other, thus preventing a water film from being formed on the outlet hole. Further, the silver ions of a proper concentration are added to the wash water in the silver ion casing, thus providing excellent anti-bacterial and bactericidal effects to laundry.

[25] Although an embodiment of the present invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

### **Description of Drawings**

[26] These and other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings of which:

[27] FIG. 1 is a perspective view of a washing machine having a detergent feeder and a colloidal silver maker, according to an embodiment of the present invention;

[28] FIG. 2 is a perspective view of the colloidal silver maker connected to the detergent feeder of the washing machine of FIG. 1;

[29] FIG. 3 is a partially cutaway perspective view of a junction between the colloidal silver maker and the detergent feeder of FIG. 2; and

[30] FIG. 4 is a sectional view taken along a line IV - IV of FIG. 3, to show a shape and

an arrangement of an outlet hole of the colloidal silver maker.

### **Best Mode**

[31] Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The embodiment is described below in order to explain the present invention by referring to the figures.

[32] FIG. 1 is a perspective view of a washing machine having a colloidal silver maker and a detergent feeder, according to an embodiment of the present invention. As shown in FIG. 1, the washing machine includes a cabinet 1 to define an external appearance of the washing machine. A door 2 opens or closes an upper portion of the cabinet 1. A washing tub 3 and a water tub (not shown) are set in the cabinet 1. A pulsator (not shown) is rotatably projected from a bottom of the washing tub 3. A motor (not shown) is provided at a predetermined position under the water tub to rotate the washing tub 3 and the pulsator.

[33] Further, the detergent feeder 10 and the colloidal silver maker 20 are provided at predetermined positions above the water tub or the washing tub 3 so that detergent and silver ions are added to wash water fed from an external water source, prior to being fed to the water tub. In a detailed description, the wash water is fed to the colloidal silver maker 20 through a water supply hose 4 which is connected to the external water source, and the silver ions of a predetermined concentration are added to the wash water. Thereafter, the wash water containing the silver ions passes through the detergent feeder 10. Thus, the wash water is fed to the water tub while being mixed with the detergent.

[34] As such, when the detergent and the silver ions are added to the wash water, the laundry is washed by a cleansing effect of the detergent, and simultaneously germs on the laundry are killed by antibacterial and bactericidal actions of the silver ions.

[35] The bactericidal action of silver will be described hereinafter in brief. The silver has no tolerance for germs, different from other common antibiotics. Further, silver is a very safe substance, because silver is nontoxic. Thus, when the laundry is washed using the silver, the laundry has better hygiene due to the antibacterial and bactericidal effects of the silver. Therefore, when a predetermined amount of silver ions are dissolved in the wash water by electrolysis and the wash water containing the silver ions is fed to the water tub, the germs on the laundry are killed while the laundry is washed using the wash water containing the silver ions.

[36] FIG. 2 is a perspective view of the colloidal silver maker of FIG. 1. As shown in

FIG. 2, the colloidal silver maker 20 includes a silver ion casing 21, a lid 22, and a pair of silver plates 23. The silver ion casing 21 defines a water passage 24 through which the wash water passes, and provides a space for the electrolysis of the silver plates 23. The lid 22 covers an upper portion of the silver ion casing 21. The silver plates 23 are placed between the silver ion casing 21 and the lid 22, and provide the silver ions to the wash water.

[37] A terminal 23a is integrally provided on an upper end of each of the silver plates 23 so that each of the silver plates 23 is electrically connected to an electric source via wires (not shown). Each of the silver plates 23 is supported by the lid 22 while the terminal 23a thereof is projected from the lid 22 by a predetermined length.

[38] An inlet hole 25 is provided on an end of the lid 22 so that the water supply hose 4 (see, FIG. 3) connected to the external water source is inserted into the inlet hole 25. On an end of the silver ion casing 21 which is far away from the inlet hole 25, is provided an outlet pipe 26 (see, FIG. 3) so that the wash water containing the silver ions is fed from the silver ion casing 21 to the detergent feeder 10 through the outlet pipe 26.

[39] The detergent feeder 10 includes a body 11, a detergent container 12, and a water spray unit 14. The body 11 is opened at a front thereof. The detergent container 12 is slidably pushed into and pulled out through the open front of the body 11, and contains the detergent therein. The water spray unit 14 is provided in the body 11 of the detergent feeder 10 to be placed above a bottom surface 12a of the detergent container 12.

[40] Thus, the wash water fed into the body 11 through the outlet pipe 26 of the colloidal silver maker 20 is sprayed from the water spray unit 14 onto the detergent container 12 so that the wash water is mixed with the detergent. Thereafter, the wash water containing the silver ions and the detergent falls into the water tub through a gap defined between the bottom surface 12a of the detergent container 12 and the body 11, thus soaking the laundry.

[41] In the detergent feeder 10 and the colloidal silver maker 20 constructed as described above, the detergent feeder 10 is mounted to the upper portion of the cabinet 1 through hook holes which are formed on brackets 13 provided on both sidewalls of the body 11, and the colloidal silver maker 20 is mounted to the upper portion of the cabinet 1 through screw holes which are formed on brackets 27 provided on an outer surface of the colloidal silver maker 20.

[42] FIG. 3 is a partially cutaway perspective view of a junction between the colloidal

silver maker and the detergent feeder. As shown in FIG. 3, the colloidal silver maker 20 is integrated with the detergent feeder 10 into a single structure, via both the outlet pipe 26 to allow the colloidal silver maker 20 to communicate with the detergent feeder 10, and a connecting part 30 provided between the colloidal silver maker 20 to the detergent feeder 10.

[43] The outlet pipe 26, having a cross-section of an elliptical shape, is integrally connected to the detergent feeder 10, thus serving as a connection pipe to allow the colloidal silver maker 20 to communicate with the detergent feeder 10. The outlet pipe 26 also serves as an inlet pipe to feed the wash water into the detergent feeder 10.

[44] Thus, the wash water fed through the water supply hose 4 flows along the water passage 24 of the silver ion casing 21 while being mixed with the silver ions dissociated from the silver plates 23. Thereafter, the wash water containing the silver ions is fed to the detergent feeder 10 through the outlet pipe 26.

[45] An outlet hole 40 of the colloidal silver maker 20 to which the outlet pipe 26 is integrally connected has a shape of an ellipse. Further, the outlet hole 40 is provided on a surface of the silver ion casing 21 to extend from a lower end toward an upper end thereof. The shape and arrangement of the outlet hole 40 will be described in the following with reference to FIG. 4.

[46] FIG. 4 is a sectional view taken along a line IV - IV of FIG. 3, to show the shape and arrangement of the outlet hole of the colloidal silver maker. As shown in FIG. 4, the outlet hole 40 is provided on a lower portion of the silver ion casing 21. The wash water mixed with the silver ions while passing through the water passage 24 (see, FIG. 3) of the silver ion casing 21, is fed to the detergent feeder 10 through the outlet hole 40.

[47] The outlet hole 40 is provided so that a vertical length thereof (i.e. height) is different from a horizontal length thereof (i.e. width), thus preventing the wash water from remaining in the silver ion casing 21 when the supply of the wash water to the colloidal silver maker 20 is stopped.

[48] Preferably, the outlet hole 40 may have the shape of the ellipse, and may extend from the lower end toward the upper end of the silver ion casing 21. Thus, the vertical length of the outlet hole 40 is longer than the horizontal length of the outlet hole 40.

[49] As such, because the outlet hole 40 has the shape of the ellipse of which a vertical length is longer than a horizontal length, a water pressure is non-uniformly distributed over the outlet hole 40 when the water supply operation is stopped. In this case, the water pressure acting on an upper end of the outlet hole 40 is minimized, thus allowing

atmospheric air to flow through the upper end of the outlet hole 40.

[50] Such shape and arrangement of the outlet hole 40 prevent the outlet hole 40 from being blocked by a water film due to a capillary action after the water supply operation is stopped, thus preventing the wash water from remaining in the silver ion casing 21.

[51] Further, it is preferable that the vertical length or height H1 of the outlet hole 40 and a height H2 of the silver ion casing 21 are in a predetermined ratio to each other, thus preventing the water film from being formed on the outlet hole 40, and allowing the silver ions of a proper concentration to be added to the wash water flowing through the silver ion casing 21.

[52] In a detailed description, when the height H1 of the outlet hole 40 is significantly higher than the height H2 of the silver ion casing 21, the wash water passes through the silver ion casing 21 too rapidly. In this case, a small amount of silver ions are added to the wash water. Conversely, when the height H1 of the outlet hole 40 is significantly less than the height H2 of the silver ion casing 21, the water film may occur, and an excessively large amount of silver ions are added to the wash water.

[53] Preferably, the height H2 of the silver ion casing 21 and the height H1 of the outlet hole 40 are in a ratio of about 3:2, thus allowing the silver ions of the proper concentration to be added to the wash water, and preventing the water film from occurring.

[54] In the colloidal silver maker 20 constructed as described above, the pair of silver plates 23 are electrically connected to the electric source through the terminals 23a of the silver plates 23. Thus, when a predetermined voltage is applied to the silver plates 23 and the wash water is fed into the colloidal silver maker 20 through the inlet hole 25 (see, FIG. 2) of the lid 22, the wash water passes through the silver plates 23 while flowing along the water passage 24 of the silver ion casing 21. At this time, the silver ions are dissociated from the silver plates 23 by the electrolysis of the silver plates 23. Thus, the silver ions of the predetermined concentration are added to the wash water.

[55] The wash water containing the silver ions sequentially passes through the outlet hole 40 and the outlet pipe 26, and is fed to the detergent feeder 10. While the wash water passing through the detergent container 12, the detergent is added to the wash water. Thereby, the wash water containing both the silver ions and the detergent falls into the water tub.

[56] When a proper amount of wash water is fed to the water tub and the water supply operation is stopped, the shape and arrangement of the outlet hole 40 according to the present invention prevent the water film from being formed on the outlet hole 40, thus

allowing the wash water to be completely discharged from the water supply hose 4 and the silver ion casing 21 through the outlet hole 40 an the outlet pipe 26 to the detergent feeder 10.